3.2) #1)

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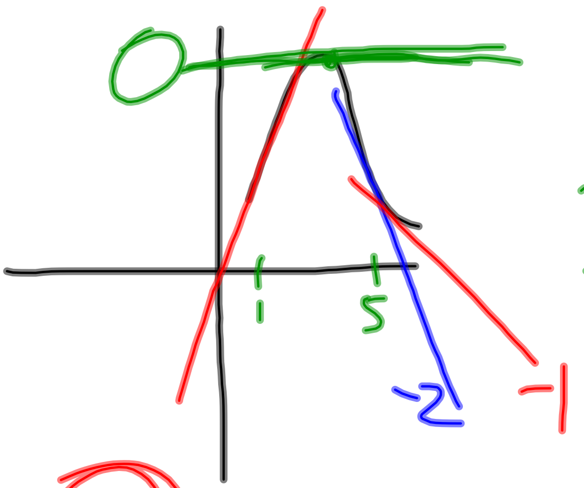


$$f'(x_0) = \lim_{x_1 \to x_0} \frac{f(x_1) - f(x_0)}{x_1 - x_0}$$

Est $f'(1)$ ...

$$\frac{5.5 - .8}{2 - 0} = \frac{4.7}{2} = 2.35$$

Est inst roc (i.e. derivative) with avg roc (i.e. slope)

2) $0 \quad f'(-3) \quad f'(0) \quad f'(2) \quad f'(4)$

1 Low $\longrightarrow$ Hi 5

3 4 $\quad$ 4.5 $\quad$ 2 $\quad$ 3 $\quad$ 1

3) a) tangent line $y = mx + b$

$y - f(a) = m(x - a)$ $f'(a)$

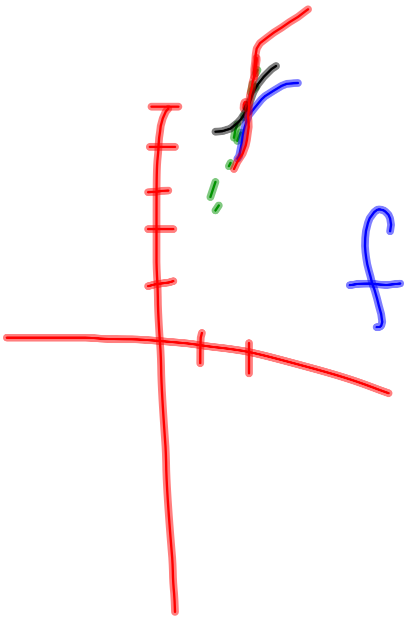
through $(a, f(a))$

what is $f'(a)$?

$f'(a) =$ SLOPE of tangent line

3b) tangent line to curve of $f(x)$ at $(2,5)$ is $y = 3x - 1$.

$f'(2) = 3$



$f'(3) = ?$ no idea

4) given that tangent line to $f(x)$ at $(-1, 3)$ passes thru $(0, 4)$, find $f'(-1)$

$$f'(-1) = \frac{3-4}{-1-0} = \frac{-1}{-1} = 1$$

4 better: find eqⁿ of tan. line.

$$y - 3 = 1(x-(-1))$$

$y = mx + b$

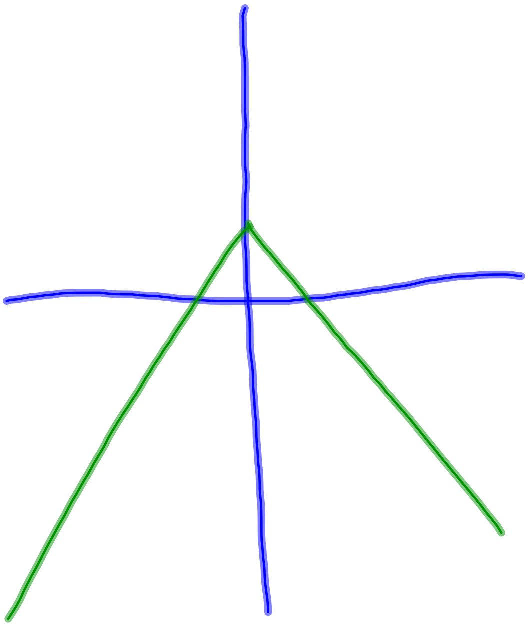
$y = x + b$ $\quad$ $y = x + 4$

$3 = -1 + b$

$b = 3-(-1) = 4$

5) Sketch graph

$f(0)=1$	$f'(x)>0$ when $x<0$
$f'(0)=0$	$f'(x)<0$ when $x>0$



inst roc of f at x_0 $= \lim\limits_{x_1 \to x_0} \dfrac{f(x_1) - f(x_0)}{x_1 - x_0}$

deriv of f at x_0 $= f'(x_0) = \lim\limits_{x_1 \to x_0} \dfrac{f(x_1) - f(x_0)}{x_1 - x_0}$

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$$f'(x) = \lim_{w \to x} \frac{f(w) - f(x)}{w - x}$$

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Notation

derivative of $f(x)$ as a $f^{\underline{n}}$

Feynman "Character of Physical Law"

physics

other eng discipline

$f'(x)$

$\dot{y}$

$\dot{x}$

$\frac{\Delta y}{\Delta x}$

$\frac{dy}{dx}$ "little inf ...... chg in y"

"little infinitesimally small chg in x"

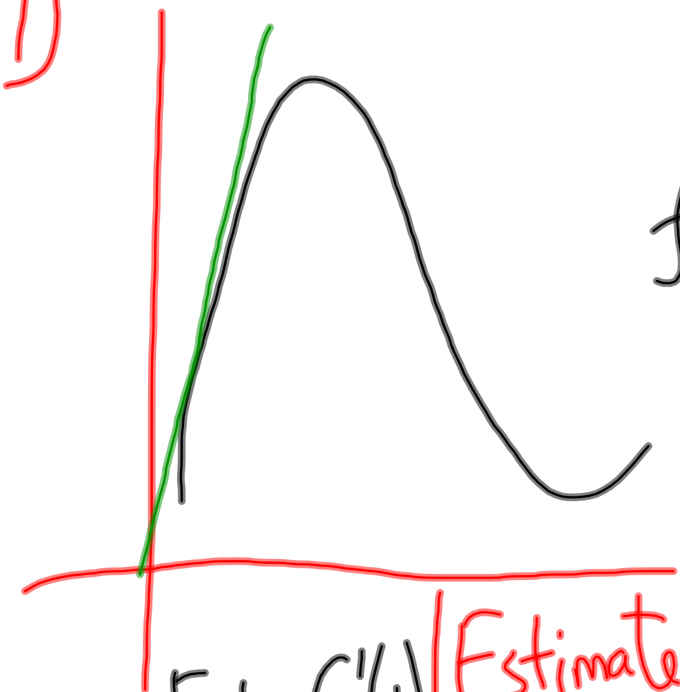
derivative of $f(x)$ at $x=a$

$f'(a)$ or $\left.\frac{dy}{dx}\right|_{x=a}$

∞

infinity sign

1)



p.177

$$f'(x_0) = \lim_{x_1 \to x_0} \frac{f(x_1) - f(x_0)}{x_1 - x_0}$$

Est $f'(1)$

$\frac{5.5 - .8}{2 - 0}$

$= \frac{4.7}{2} \approx 2.35$

SB: 2.66

AT: 2.5

Estimate $f'(1)$ with average rate of chg around 1

OR

with slope of tangent line at $x=1$

$f'(3) = 0$

$f'(5) = -2$

$f'(6) = -1$

2) $0 \quad f'(-3) \quad f'(0) \quad f'(2) \quad f'(4)$

$4 \quad 5 \quad 2 \quad 3 \quad 1$

$1 = \text{Low}$ $\qquad\qquad\qquad\qquad$ $5 = \text{Hi}$

$f'(4) \quad f'(0) \quad f'(-3) \quad f'(2) \quad 0$

$0 \qquad f'(-3)$

$0 \quad f'(2) \quad f'(4) \quad f'(0) \quad f'(-3) \qquad f'(-3)$

3) you have an eqn of a tangent line at $(a, f(a))$

e.g.

$y - f(a) = m(x-a)$

or

$y = mx + b$

how would you find $f'(a)$?

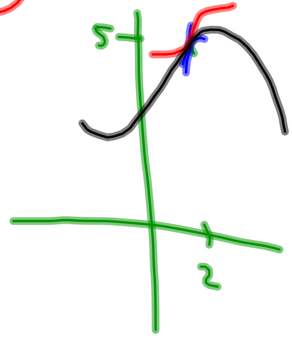
b +c Given that tangent line to $y=f(x)$ at $(2,5)$ has eqn $y=3x-1$

find $f'(2) = 3$

b*: find $f'(3)$

YOU FIND $f'(3)$

you don't know



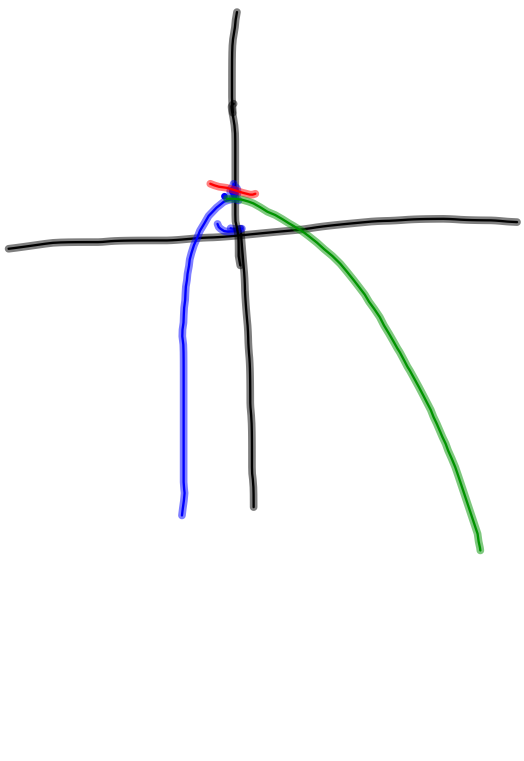
1111) the tan line to the curve of f(x) at the pt (-1,3) passes thru (0,4). Find f'(-1)

$$\frac{4-3}{0+1} = \frac{1}{1} = 1$$

$(0-(-1))$

V) s.a.g.

$f(0)=1$	$f'(x)<0$ when $x>0$
$f'(0)=0$	$f'(x)>0$ when $x<0$



NOTATION

derivative of $f(x)$

$f'(x)$ $\qquad$ $\frac{dy}{dx}$ $\qquad$ $\frac{\Delta y}{\Delta x}$

"tiny infinitesimally small difference"

"large measurable difference"

Feynman
"Character of Physical Law"

Physics
Eng.

$\dot{y}$

derivative of $f(x)$ at $x=a$

$f'(a)$ $\qquad$ $\left.\frac{dy}{dx}\right|_{x=a}$

p177

$$f'(x_0) = \lim_{x_1 \to x_0} \frac{f(x_1) - f(x_0)}{x_1 - x_0}$$

p180

$$f'(x) = \lim_{w \to x} \frac{f(w) - f(x)}{w - x}$$